

CLAIMS

What is claimed is:

1. A communication system, including:

5 a receiver;
a transmitter; and

a serial link between the transmitter and the receiver, wherein the transmitter is coupled to receive input data, configured to generate a sequence of selected code words by encoding the input data, and configured to transmit the sequence of selected
10 code words to the receiver over the serial link, wherein each of the selected code words is a member of a robust subset of a full code word set, the input data can be encoded as a conventional sequence of code words of the full code word set, and the sequence of selected code words is less susceptible to inter-symbol interference during transmission over the link than would be the conventional sequence of code words.

15 2. The system of claim 1, wherein the input data are auxiliary data, the transmitter is coupled to receive video data and configured to generate a sequence of video code words by encoding the video data, and the transmitter is configured to transmit to the receiver over the serial link a first burst of the video code words
20 followed by a burst of the selected code words followed by a second burst of the video code words, wherein each of the video code words is a member of the full code word set and at least one of the video code words is not a member of the robust subset.

25 3. The system of claim 2, wherein the transmitter is also coupled to receive control bits, configured to generate bursts of encoded control words by encoding the control bits, and configured to transmit to the receiver over the serial link a first burst of the encoded control words between the first burst of the video code words and the burst of the selected code words, and a second burst of the encoded control words
30 between the burst of the selected code words and the second burst of the video code words.

4. The system of claim 3, wherein the selected code words include at least one guard band word, the burst of the selected code words has an initial word, and the initial word is the guard band word.

5. The system of claim 3, wherein the selected code words include at least one guard band word, the burst of the selected code words has an initial set of words, and each word of the initial set of words is one said guard band word.

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6. The system of claim 3, wherein the selected code words include at least one guard band word, the burst of the selected code words has a final word, and the final word is the guard band word.

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7. The system of claim 3, wherein the selected code words include at least one guard band word, the burst of the selected code words has a final set of words, and each word of the final set of words is one said guard band word.

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8. The system of claim 3, wherein the serial link is a TMDS link, and the selected code words consist of seventeen different, transition-minimized TMDS code words, including at least one transition-minimized TMDS code word used as a guard band word.

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9. The system of claim 3, wherein the selected code words include at least two guard band words, including a first guard band word and a second guard band word, the second burst of the video code words has an initial word, the initial word of the second burst of the video code words is the first guard band word, the burst of the selected code words has an initial word, and the initial word of the burst of the selected code words is the second guard band word.

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10. The system of claim 9, wherein the serial link is a TMDS link, and the selected code words consist of seventeen different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as said second guard band word and another transition-minimized TMDS code word used as said first guard band and also used as one of the selected code words in said burst of the selected code words.

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11. The system of claim 1, wherein the input data are auxiliary data, the transmitter is coupled to receive video data and configured to generate a sequence of

video code words by encoding the video data, and the transmitter is configured to transmit to the receiver over the serial link a burst of the selected code words followed by a burst of the video code words, wherein each of the video code words is a member of the full code word set and at least one of the video code words is not a member of the robust subset.

12. The system of claim 11, wherein the transmitter is also coupled to receive control bits, configured to generate bursts of encoded control words by encoding the control bits, and configured to transmit to the receiver over the serial link a burst of the encoded control words between the burst of the selected code words and the burst of the video code words.

13. The system of claim 12, wherein the selected code words include at least one guard band word, the burst of the video code words has an initial word, and the initial word is the guard band word.

14. The system of claim 12, wherein the selected code words include at least one guard band word, the burst of the video code words has an initial set of words, and each word of the initial set of words is one said guard band word.

15. The system of claim 1, wherein the serial link is a TMDS link.

16. The system of claim 15, wherein the selected code words consist of seventeen different TMDS code words, including one TMDS code word used only as a guard band word.

17. The system of claim 15, wherein the selected code words consist of seventeen different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as a guard band word.

18. The system of claim 1, wherein each of the selected code words is an L-bit binary word.

19. The system of claim 1, wherein each of the selected code words is an L-bit binary word, and each of at least a subset of the selected code words is indicative of an M-bit word of the input data, where M is less than L.

5 20. The system of claim 19, wherein $L = 10$, and $M = 4$.

21. The system of claim 19, wherein the transmitter is coupled to receive source words of the input data, where each of the source words comprises N bits, N is less than L, and N is greater than M, and the transmitter is configured to pack the source
10 words into M-bit words of the input data and to encode each of the M-bit words of the input data as one of the selected code words.

22. The system of claim 1, wherein each of the selected code words is an L-bit binary word, a first subset of the selected code words is indicative of an M-bit word of
15 the input data, where M is less than L, and a second subset of the selected code words is indicative of an N-bit word of the input data, where N is less than M.

23. The system of claim 22, wherein $L = 10$, $M = 4$, and $N = 2$.

20 24. The system of claim 1, wherein the full code word set is a set of 10-bit, transition-minimized, TMDS code words.

25 25. The system of claim 1, wherein each of the selected code words is indicative of a sequence of L binary bits, and the selected code words have fewer contiguous zero bits and continuous one bits per code word on the average than do the code words of
25 the full code word set excluding the selected code words.

26. The system of claim 1, wherein each of the selected code words is indicative of a different sequence of binary bits, the transmitter is configured to transmit the
30 sequence of selected code words to the receiver over the serial link as a sequence of rising and falling voltage transitions, and the selected code words have bit patterns that implement DC balancing by limiting voltage drift of the serial link during transmission of said sequence of selected code words to a predetermined amount.

27. The system of claim 1, wherein the input data are auxiliary data, the transmitter is coupled to receive video data and configured to generate a sequence of video code words by encoding the video data, and the transmitter is configured to transmit to the receiver over the serial link a first burst of the video code words
5 followed by at least two bursts of the selected code words followed by a second burst of the video code words, wherein each of the video code words is a member of the full code word set and at least one of the video code words is not a member of the robust subset.

10 28. A communication system, including:
a receiver;
a transmitter; and
a serial link, a second serial link, and a third serial link between the transmitter and the receiver, wherein the transmitter is coupled to receive input data and video
15 data, configured to generate sequences of selected code words by encoding the input data and to generate sequences of video code words by encoding the video data, and configured to transmit to the receiver over the serial link a burst of the selected code words followed by a burst of the video code words, to transmit to the receiver over the second serial link a second burst of the selected code words followed by a second
20 burst of the video code words, and to transmit to the receiver over the third serial link a third burst of the selected code words followed by a third burst of the video code words,

wherein each of the selected code words is a member of a robust subset of a full code word set, each of the video code words is a member of the full code word set,
25 and at least one of the video code words is not a member of the robust subset, and

wherein the input data determined by the burst of the selected code words can be encoded as a first conventional sequence of the code words of the full code word set, the input data determined by the second burst of the selected code words can be encoded as a second conventional sequence of the code words of the full code word set, and the input data determined by the third burst of the selected code words can be
30 encoded as a third conventional sequence of the code words of the full code word set, and wherein said burst of the selected code words is less susceptible to inter-symbol interference during transmission over the serial link than would be the first conventional sequence, said second burst of the selected code words is less susceptible

to inter-symbol interference during transmission over the second serial link than would be the second conventional sequence, and said third burst of the selected code words is less susceptible to inter-symbol interference during transmission over the third serial link than would be the third conventional sequence.

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29. The system of claim 28, wherein the transmitter is also coupled to receive control bits, configured to generate sequences of encoded control words by encoding the control bits, and configured to transmit to the receiver over the serial link a burst of the encoded control words between the burst of the selected code words and the burst of the video code words, to transmit to the receiver over the second serial link a second burst of the encoded control words between the second burst of the selected code words and the second burst of the video code words, and to transmit to the receiver over the third serial link a third burst of the encoded control words between the third burst of the selected code words and the third burst of the video code words.

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30. The system of claim 28, wherein the serial link is a first video channel of a TMDS link, the second serial link is a second video channel of the TMDS link, and the third serial link is a third video channel of the TMDS link.

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31. The system of claim 30, wherein the selected code words consist of seventeen different TMDS code words, including one TMDS code word used only as a guard band word.

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32. The system of claim 30, wherein the selected code words consist of seventeen, different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as a guard band word.

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33. A transmitter for use in data transmission over a serial link, said transmitter including:

at least one input for receiving input data;
an output configured to be coupled to a channel of the link; and
circuitry, coupled to each said input and to the output, and configured to generate a sequence of selected code words by encoding the input data and to assert the sequence of selected code words to the output in response to the input data,

wherein each of the selected code words is a member of a robust subset of a full code word set, the input data can be encoded as a conventional sequence of code words of the full code word set, and the sequence of selected code words is less susceptible to inter-symbol interference during transmission over the link than would be the
5 conventional sequence of code words.

34. The transmitter of claim 33, wherein the input data include auxiliary data and video data, and the circuitry is configured to generate a sequence of video code words by encoding the video data, and to assert to the output a first burst of the video
10 code words followed by a burst of the selected code words followed by a second burst of the video code words, wherein each of the video code words is a member of the full code word set and at least one of the video code words is not a member of the robust subset.

35. The transmitter of claim 34, wherein the circuitry is also coupled to receive control bits, configured to generate bursts of encoded control words by encoding the control bits, and to assert to the output a first burst of the encoded control words
15 between the first burst of the video code words and the burst of the selected code words, and a second burst of the encoded control words between the burst of the selected code words and the second burst of the video code words.
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36. The transmitter of claim 35, wherein the selected code words include at least one guard band word, the burst of the selected code words has an initial word, and the initial word is the guard band word.
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37. The transmitter of claim 35, wherein the selected code words include at least one guard band word, the burst of the selected code words has an initial set of words, and each word of the initial set of words is one said guard band word.

38. The transmitter of claim 35, wherein the selected code words include at least one guard band word, the burst of the selected code words has a final word, and the final word is the guard band word.
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39. The transmitter of claim 35, wherein the selected code words include at least one guard band word, the burst of the selected code words has a final set of words, and each word of the final set of words is one said guard band word.

5 40. The transmitter of claim 35, wherein the serial link is a TMDS link, and the selected code words consist of seventeen different, transition-minimized TMDS code words, including at least one transition-minimized TMDS code word used as a guard band word.

10 41. The transmitter of claim 35, wherein the selected code words include at least two guard band words, including a first guard band word and a second guard band word, the second burst of the video code words has an initial word, the initial word of the second burst of the video code words is the first guard band word, the burst of the selected code words has an initial word, and the initial word of the burst of the
15 selected code words is the second guard band word.

20 42. The transmitter of claim 41, wherein the serial link is a TMDS link, and the selected code words consist of seventeen different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as said second guard band word and another transition-minimized TMDS code word used as said first guard band and also used as one of the selected code words in said burst of the selected code words.

25 43. The transmitter of claim 34, wherein the serial link is a TMDS link, and the selected code words consist of seventeen different TMDS code words, including one TMDS code word used only as a guard band word.

30 44. The transmitter of claim 43, wherein the selected code words consist of seventeen different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as the guard band word.

45. The transmitter of claim 33, wherein each of the selected code words is an L-bit binary word.

46. The transmitter of claim 33, wherein each of the selected code words is an L-bit binary word, and each of at least a subset of the selected code words is indicative of an M-bit word of the input data, where M is less than L.

5 47. The transmitter of claim 46, wherein $L = 10$, and $M = 4$.

48. The transmitter of claim 46, wherein the circuitry is coupled to receive source words of the input data, where each of the source words comprises N bits, N is less than L, and N is greater than M, and the circuitry is configured to pack the source
10 words into M-bit words of the input data and to encode each of the M-bit words of the input data as one of the selected code words.

49. The transmitter of claim 33, wherein each of the selected code words is an L-bit binary word, a first subset of the selected code words is indicative of an M-bit
15 word of the input data, where M is less than L, and a second subset of the selected code words is indicative of an N-bit word of the input data, where N is less than M.

50. The transmitter of claim 49, wherein $L = 10$, $M = 4$, and $N = 2$.

20 51. The transmitter of claim 33, wherein the full code word set is a set of 10-bit, transition-minimized, TMDS code words.

52. The transmitter of claim 33, wherein each of the selected code words is indicative of a sequence of L binary bits, and the selected code words have fewer
25 contiguous zero bits and continuous one bits per code word on the average than do the code words of the full code word set excluding the selected code words.

53. The transmitter of claim 33, wherein each of the selected code words is indicative of a different sequence of binary bits, the circuitry is configured to assert the
30 sequence of selected code words as a sequence of rising and falling voltage transitions, and the selected code words have bit patterns that implement DC balancing by limiting voltage drift of the serial link during transmission of said sequence of selected code words to a predetermined amount.

54. A method for encoding data for transmission over a serial link, said method including the steps of:

(a) providing words of input data capable of being encoded as a conventional sequence of code words of a full code word set; and

5 (b) generating a sequence of selected code words by encoding the input data, wherein each of the selected code words is a member of a robust subset of the full code word set, and the sequence of selected code words is less susceptible to inter-symbol interference during transmission over the link than would be the conventional sequence of code words.

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55. The method of claim 54, wherein the input data include auxiliary data and video data, and also including the steps of:

generating a sequence of video code words by encoding the video data; and

transmitting over the link a first burst of the video code words followed by a

15 burst of the selected code words followed by a second burst of the video code words, wherein each of the video code words is a member of the full code word set and at least one of the video code words is not a member of the robust subset.

56. The method of claim 55, also including the steps of:

20 generating bursts of encoded control words by encoding control bits; and

transmitting over the link a first burst of the encoded control words between the first burst of the video code words and the burst of the selected code words, and a second burst of the encoded control words between the burst of the selected code words and the second burst of the video code words.

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57. The method of claim 56, wherein the selected code words include at least one guard band word, the burst of the selected code words has an initial word, and the initial word is the guard band word.

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58. The method of claim 56, wherein the selected code words include at least one guard band word, the burst of the selected code words has an initial set of words, and each word of the initial set of words is one said guard band word.

59. The method of claim 56, wherein the selected code words include at least one guard band word, the burst of the selected code words has a final word, and the final word is the guard band word.

5 60. The method of claim 56, wherein the selected code words include at least one guard band word, the burst of the selected code words has a final set of words, and each word of the final set of words is one said guard band word.

10 61. The method of claim 56, wherein the selected code words consist of seventeen different, transition-minimized TMDS code words, including at least one transition-minimized TMDS code word used as a guard band word.

15 62. The method of claim 56, wherein the selected code words include at least two guard band words, including a first guard band word and a second guard band word, the second burst of the video code words has an initial word, the initial word of the second burst of the video code words is the first guard band word, the burst of the selected code words has an initial word, and the initial word of the burst of the selected code words is the second guard band word.

20 63. The method of claim 62, wherein the selected code words consist of seventeen different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as said second guard band word and another transition-minimized TMDS code word used as said first guard band and also used as one of the selected code words in said burst of the selected code words.

25 64. The method of claim 54, wherein the selected code words consist of seventeen different TMDS code words, including one TMDS code word used only as a guard band word.

30 65. The method of claim 54, wherein the selected code words consist of seventeen different, transition-minimized TMDS code words, including one transition-minimized TMDS code word used only as a guard band word.

66. The method of claim 54, wherein each of the selected code words is an L-bit binary word.

67. The method of claim 54, wherein each of the selected code words is an L-bit
5 binary word, and each of at least a subset of the selected code words is indicative of an M-bit word of the input data, where M is less than L.

68. The method of claim 67, wherein $L = 10$, and $M = 4$.

69. The method of claim 67, wherein step (a) includes the step of providing
10 source words of the input data, where each of the source words comprises N bits, N is less than L, and N is greater than M, and step (b) includes the steps of packing the source words into M-bit words of the input data and encoding each of the M-bit words of the input data as one of the selected code words.

70. The method of claim 54, wherein each of the selected code words is an L-bit
15 binary word, a first subset of the selected code words is indicative of an M-bit word of the input data, where M is less than L, and a second subset of the selected code words is indicative of an N-bit word of the input data, where N is less than M.

71. The method of claim 70, wherein $L = 10$, $M = 4$, and $N = 2$.

72. The method of claim 54, wherein the full code word set is a set of 10-bit,
20 transition-minimized, TMDS code words.

73. The method of claim 54, wherein each of the selected code words is
25 indicative of a sequence of L binary bits, and the selected code words have fewer contiguous zero bits and continuous one bits per code word on the average than do the code words of the full code word set excluding the selected code words.

74. The method of claim 54, wherein each of the selected code words is
30 indicative of a different sequence of binary bits, and also including the step of:
transmitting the sequence of selected code words over the serial link as a
sequence of rising and falling voltage transitions, wherein the selected code words have

bit patterns that implement DC balancing by limiting voltage drift of the serial link during transmission of said sequence of selected code words to a predetermined amount.

5 75. The method of claim 54, wherein the input data include auxiliary data and video data, and also including the steps of:

generating a sequence of video code words by encoding the video data; and

transmitting over the link a first burst of the video code words followed by at

10 least two bursts of the selected code words followed by a second burst of the video code words, wherein each of the video code words is a member of the full code word set and at least one of the video code words is not a member of the robust subset.